WHAT IS CLAIMED IS:

1. A monitoring system for a circuit that operates at high frequencies and low temperatures to handle an electrical signal having high-frequency spectral components, comprising:

an input coupler having a space where a given high-frequency probing signal can propagate, which combines the propagating high-frequency probing signal with a given electrical input signal, thus producing a combined signal;

a high-frequency circuit which applies a prescribed processing function to the combined signal supplied from said input coupler; and

an output coupler, coupled to said high-frequency circuit to receive the combined signal therefrom, which has a space where a high-frequency probing signal component in the received combined signal can propagate and extracts the high-frequency probing signal component having propagated therethrough.

2. The monitoring system according to claim 1, wherein said input coupler comprises:

a planar transmission line using oxide superconductive material to carry the given electrical input signal; and

a probe with an open-ended antenna placed near

said planar transmission line, the open-ended antenna being shorter than a quarter wavelength of an intended maximum monitoring frequency.

3. The monitoring system according to claim 2, wherein said planar transmission line is formed on a substrate that is made of at least one of magnesium oxide, cerium oxide-coated sapphire, strontium titanate, lanthanum aluminate, and magnesium titanate.

4. The monitoring system according to claim 2, wherein the oxide superconductive material contains a rare-earth element.

5. The monitoring system according to claim 2, wherein the oxide superconductive material is a copper-oxide superconductor.

6. The monitoring system according to claim 1, wherein said output coupler comprises:

a planar transmission line using oxide superconductive material to carry the combined signal received from the high-frequency circuit; and

a probe with an open-ended antenna placed near said planar transmission line, the open-ended antenna being shorter than a quarter wavelength of an intended maximum monitoring frequency.

7. The monitoring system according to claim 6, wherein the oxide superconductive material contains a rare-earth element.

8. The monitoring system according to claim 6, wherein the oxide superconductive material is a copper-oxide superconductor.

9. The monitoring system according to claim 6, further comprising a detector that detects the high-frequency probing signal component extracted by said output coupler.

10. The monitoring system according to claim 9, wherein said detector comprises a semiconductor diode to receive the output of said probe.

11. The monitoring system according to claim 1, further comprising an oscillator that produces and supplies the high-frequency probing signal to said input coupler.

12. The monitoring system according to claim 11, wherein said oscillator is a variable frequency oscillator that produces the high-frequency probing signal by sweeping operating frequency range of the high-

frequency circuit being monitored.

13. A method of monitoring a high-frequency circuit that operates at a low temperature to handle an electrical signal having high-frequency spectral components, comprising the steps of:

providing an input coupler at an input end of the high-frequency circuit, the input coupler having a space where a given high-frequency probing signal can propagate;

combining the propagating high-frequency probing signal and a given electrical input signal into a combined signal;

entering the combined signal to the high-frequency circuit;

providing an output coupler at an output end of the high-frequency circuit to receive the combined signal therefrom, the output coupler having a space where a high-frequency probing signal component in the received combined signal can propagate; and

extracting the high-frequency probing signal component that has propagated through the space in the output coupler.

14. The method according to claim 13, wherein the input coupler comprises:

a planar transmission line using oxide superconductive material to carry the given electrical

input signal; and

a probe with an open-ended antenna placed near said planar transmission line, the open-ended antenna being shorter than a quarter wavelength of an intended maximum monitoring frequency.

15. The method according to claim 13, wherein the output coupler comprises:

a planar transmission line using oxide superconductive material to carry the combined signal received from the high-frequency circuit; and

a probe with an open-ended antenna placed near said planar transmission line, the open-ended antenna being shorter than a quarter wavelength of an intended maximum monitoring frequency.

16. The method according to claim 15, further comprising the steps of providing a detector to detect the high-frequency probing signal component extracted by the output coupler.

17. The method according to claim 16, wherein the detector comprises a semiconductor diode to receive the output of the probe.

18. The method according to claim 13, further comprising the step of providing an oscillator which

produces and supplies the high-frequency probing signal to the input coupler.

19. The method according to claim 18, wherein the oscillator is a variable frequency oscillator that produces the high-frequency probing signal by sweeping operating frequency range of the high-frequency circuit being monitored.

20. The method according to claim 14, wherein the oxide superconductive material contains a rare-earth element.

21. The method according to claim 14, wherein the oxide superconductive material is a copper-oxide superconductor.

22. The method according to claim 14, wherein the planar transmission line is formed on a substrate that is made of at least one of magnesium oxide, cerium oxide-coated sapphire, strontium titanate, lanthanum aluminate, and magnesium titanate.